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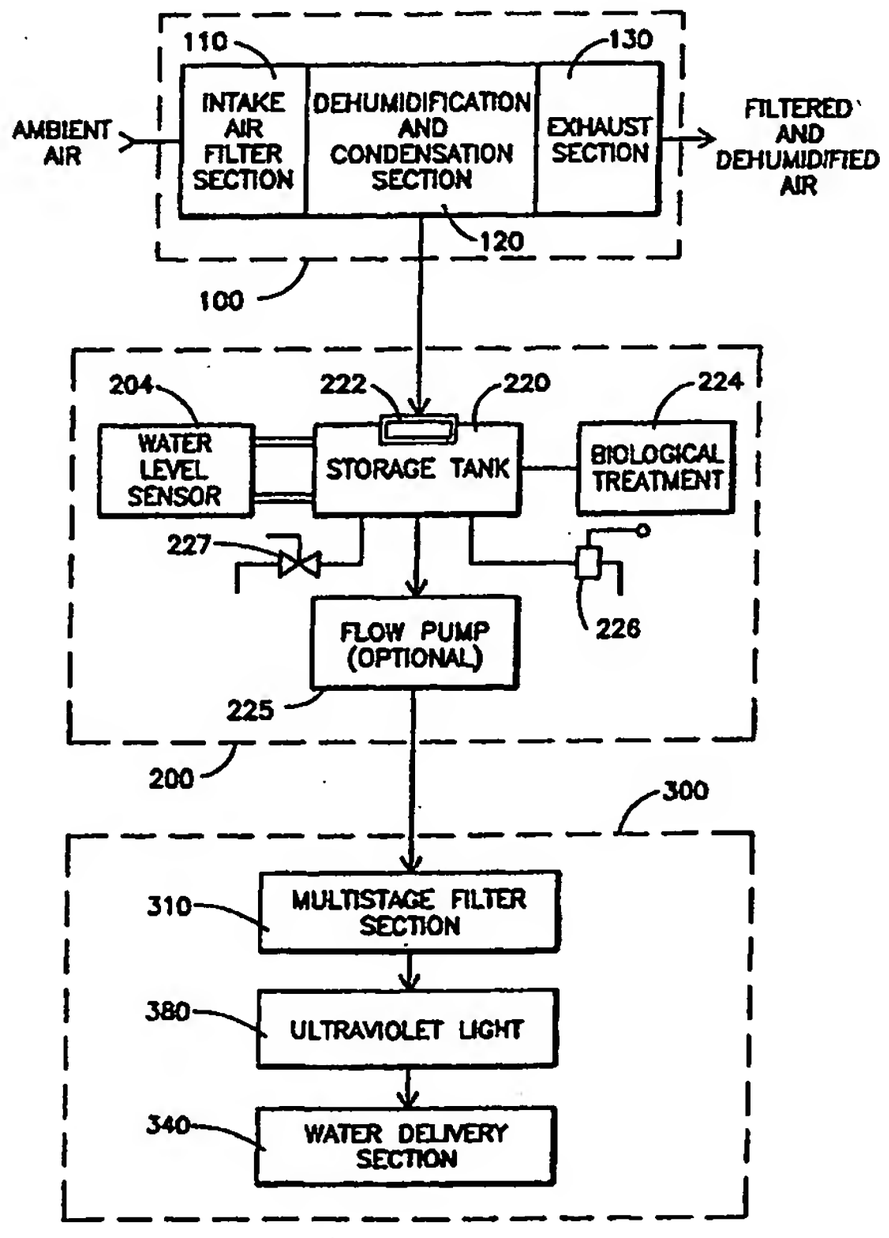
(54) Title: AMBIENT AIR WATER EXTRACTION AND SUPPLY APPARATUS AND METHOD

(57) Abstract

An ambient air water extraction, and purified water supply apparatus includes a sealed water extraction stage (100) that is operative to draw in, filter air (103); and extract water vapor from ambient air to return the filtered, and dehumidified air to the environment. A sealed water storage tank (220) provides biological treatment (224) for water that has been condensed out of the filtered ambient air by the water extraction stage (100). An optional multistage water filtration, and delivery (300) stage installed in a sealed water flow path, with a downstream water flow control mechanism. The multistage filtration section (300) is coupled to the water storage tank (220) through a pressure demand water pump (225) that discharges through a plurality of filters (310) that are effective to filter out particulate, to dissolve chemicals, and biological contaminants. The filtered water is pumped by a water flow pump (225) from the water storage tank for delivery to an optional purified water delivery section (350) that provides, and dispenses potable drinking water in different forms which include room temperature (334), hot (330), cold (332), carbonated (320), flavored soft drink, provides a connection to the refrigerator for chilled water, and ice cubes.



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AMBIENT AIR WATER EXTRACTION AND SUPPLY APPARATUS AND METHOD

Cross-reference to Related Applications

The present application claims the benefit of previously filed co-pending U.S. Provisional Patent Applications, Serial No.60/026,342, filed September 19, 1996 and EE60978909505, filed May 1,1998.

Field of the Invention

The present invention relates to water supply apparatuses, and is particularly directed to a relatively compact, lightweight, economical and portable apparatus, the internal components of which are sealed from the surrounding atmosphere, for extracting water from water vapor in filtered ambient air, and then treating, storing, filtering and dispensing purified water, by a water recovery scheme that also improves the quality of the air returned to the environment through a process of dehumidification, and filtration.

Background of the Invention

Although a variety of water extraction and treatment systems have been proposed to date for recovering potable water from the water vapor present in the ambient air, each has its own shortcomings, either from a standpoint of complexity and energy required (including heat dissipated into the atmosphere), or its failure to take into account a number of contaminant parameters that may be present in the air or in the water being made available for human consumption. While many of these Systems are touted as portable, their operation and the quality of the water produced by the extraction process is often dependent upon the environment in which they operate.

For example, while a number of systems are condensation-based, the water recovery path to post extraction storage and treatment components may be

exposed to the environment and thereby allow entry of contaminants. In addition, many systems are not readily suited for indoor use for various reasons, one of which is their size or negative impact on the closed environment due to heating and recirculation of contaminants.

The present invention can be free standing for installation at any selected location within the home, office, in the basement, garage, or any convenient location. An optional enclosure can be provided to match the decor of the location the apparatus is installed in.

Summary of the Invention

In accordance with the present invention, the shortcomings of conventional water supply systems, including portable extraction systems intended for indoor use, are remedied by what is effectively an environmentally friendly water extraction apparatus, that not only provides highly purified water, but also improves the quality of the ambient air from which the water is being extracted prior to returning the air to the surrounding environment.

For this purpose, the present invention comprises an integrated arrangement of a water extraction stage, a water collection, chemical addition, storage/reservoir stage, and a water filtration sterilization and delivery stage. The entirety of the air and water processing paths through the integrated multistage system is sealed from the surrounding environment, so as to prevent entry of contaminants into any part of the system and thereby ensure purity of the water. This sealed configuration of the water extraction, purification, storage, filtration, sterilization, and delivery components of the present invention enables the invention to be utilized in substantially any environment, including those

containing substantial amounts of industrial, agricultural, biological, chemical, and other forms of pollutants.

The water extraction stage is operative to draw in and filter ambient air, and then extract water vapor from the ambient air. Once the drawn-in ambient air has been dehumidified by the water extraction process, the dehumidified filtered air is returned to the environment.

The water extraction stage resides in a sealed housing, so as to prevent leaks between the external ambient and the interior of the entire water extraction subsystem contained therein. This effectively eliminates any chance of unfiltered air or other contaminants from entering components of the water extraction stage, as well as downstream water collecting, chemical addition, storage, purification, and delivery subsystems.

By means of a forced air unit, ambient air is drawn through an air inlet port to an intake air filter section that includes an active, small particle (electrostatic) filter. This filter serves to filter the intake air of all dust, mold, animal dander, or any unwanted air-borne particles. The filtered intake air is then drawn through a water extraction (evaporation and condensation) section, which contains an evaporator and condenser coil arrangement, that condenses water from water vapor in the filtered intake air, prior to the air being returned to the surrounding environment. An optional deicing heater element or an automatic hot-gas defrost to prevent freezing of the evaporator coils when the unit is operating in temperatures below sixty-five degrees Fahrenheit, can be provided.

The forced air unit is controlled in accordance with the output of a high level sensor, sensing the water level in the collection tank of the water collection stage. The forced air unit is activated (draws air into the system), as long as the high water level sensor element detects that the water within the storage tank is

below a prescribed "high" level (i.e., the water storage tank is less than a predetermined level). As condensed water is collected, it is channeled through a water collection conduit to the water storage tank. When the water level sensor detects that the storage tank is full, the various powered components of the water extraction section are turned off.

The water storage stage includes a chemical treatment or disinfectant capability to treat stored water that has been condensed out of the filtered ambient air by the water extraction stage. The water filtration stage comprises a water filtration section installed in the water flow path between the water extraction stage and the storage tank. The water filter filters out, that is, absorbs or blocks, substantially all particulate, as well as dissolved chemicals and biological contaminants that may be in the condensed water.

Alternate filters may be provided to effectively adjust the pH of the water and remove particles of sediment, rust, dirt, and sand; absorb halogens and other contaminants, eliminating industrial and agricultural residual chemical compounds, as well as herbicides, pesticides, industrial and commercial cleaners and other Trihalomethanes (THMs).

As water is filtered by the filtration section, it flows by gravity into the storage tank.

Electrical power for operating the water extraction system of the present invention may be derived from any conventional AC source. In addition, auxiliary power may be supplied by a number of sources, including a commercially available twelve volt direct current wind-driven generator, and a commercially available twelve volt direct current photoelectric solar array, connected via a switch to a twelve volt direct current storage battery. Also, an auxiliary emergency battery back-up trickle charge circuit may be coupled with

the switch to selectively provide a trickle charge to the battery. The trickle charger keeps the direct current storage battery fully charged, so that the battery can be used to power the extraction stage via the direct current-to-alternating current converter.

The storage battery can be maintained fully charged, so as to enable the water extraction stage to be operated without conventional power for a limited period.

The above and other objects, features and advantages of the present invention should become even more readily apparent to those skilled in the art upon a reading of the following detailed description in conjunction with the drawings wherein there is shown and described illustrative embodiments of the invention.

Brief Description of the Drawings

In the following detailed description, reference will be made to the attached drawings in which:

FIG. 1 is a diagrammatic view of the functional architecture of a sealed, purified water supply apparatus in accordance with an embodiment of the present invention;

FIG. 2 shows the details of the water extraction stage 100 of the apparatus of **FIG. 1**;

FIG. 3 shows the details of the optional multistage water filtration and delivery stage of the apparatus of **FIG. 1**; and

FIG. 4 is a diagrammatic view of sources of optional electrical power supply for operating the purified water supply apparatus of the present invention.

Detailed Description of the Preferred Embodiment

For purposes of describing the preferred embodiment, the terminology used in reference to the numbered components in the drawings is as follows:

100. water extraction stage
101. sealed housing
103. air inlet port
104. condensing coil
110. intake air filter section
120. water evaporation and condensation section
122. primary refrigeration evaporator coil
123. compressor unit
124. fan assembly
124H. de-icing heater element
130. exhaust section
200. water storage stage
204. water level sensor
220. water storage tank
222. filter
224. biological treatment
225. water flow pump
226. hand pump
227. gravity drain faucet
300. water filtration and delivery stage
310. multistage water filtration section
312. flow meter
320. valve
321. pH adjustment filter
323. carbon block filter
334. output valve
340. purified water delivery section
350. delivery section
372. water heater
373. water cooler
375. chilled water supply
380. ultra violet light
390. carbonation tank
391. mixing valve
392. beverage dispenser
401. direct current wind-driven generator
403. direct current photoelectric solar array
407. switch
410. direct current storage battery
411. trickle charger
412. DC-AC converter

An embodiment of the purified water supply apparatus of the present invention will now be described with reference to **FIGS. 1-4**. The overall functional architecture of the invention is shown in **FIG. 1**, while **FIGS. 2** through **4** illustrate the manner in which the components of the respective air and water processing stages of **FIG. 1** are interconnected within a relatively space efficient structure, that is portable. When the optional multistage water filtration and delivery stage is added and the components are mounted within a cabinet, it shall be fitted with casters.

The present invention comprises essentially three stages, a sealed, integrated arrangement of a water extraction stage **100**, a water storage stage **200**, and a water filtration and delivery stage **300**. The water extraction stage **100** (shown in detail in **FIG. 2**) is operative to draw in ambient air, and extract therefrom water vapor present in the air. The air flow path through the intake air filter section **110** is relatively "upstream" of a water evaporation and condensation section **120**. Once the drawn-in ambient air is filtered and dehumidified in the water extraction stage it is then returned to the surrounding environment through an exhaust section **130**.

The water storage stage **200** includes a storage tank **220**, coupled to the water extraction stage **100** through a filter **222** and covered, so as to prevent entry of any contaminants into the collected water flow path to the water storage tank **220**, which stores water that has been extracted or condensed out of the filtered ambient air by the water evaporation and condensation section **120** of the water extraction stage **100**.

As water is introduced into the storage tank **220**, it receives biological treatment **224** by means of an optional ozone light or ultra violet light to kill any biological contaminant that may be in the water in the storage tank **220**. The storage tank water level sensor **204** controls the operation of the evaporation and condensing section **120** by, among other controls, turns the system ON for low level and OFF for high levels.

Referring now to **FIG. 2**, the water extraction stage **100** is shown contained in a sealed housing **101** and having an air inlet port **103** through which ambient air enters stage **100**. Because the housing **101** is sealed, there are no leaks between the external ambient and the interior of the entire air intake, water extraction, and air exhaust sections contained therein. This sealing effectively

eliminates any chance of unfiltered air or other contaminants, such as unwanted foreign airborne, insects, mold spores, dust, dust mites, or animal/insect dander from entering the water extraction, water storage, and multistage, filtration, and delivery stage components.

The air inlet port is in fluid communication with the intake air filter **110** installed in the air intake stream, through which all air entering the stage must pass. The intake air filter section **110** includes at least one intake air filter, such as an active electrostatic small particle filter **110** (as a non-limiting example). Such filters serve to filter the intake air of all dust, mold, or other unwanted airborne particles.

Coupled in the intake airflow path immediately downstream of the intake air filter **110** is the evaporation and condensation section **120**. As described briefly above, the water evaporation and condensation section **120** contains at least one water extraction element that is operative to extract water vapor present in the intake air that has passed through the intake air filter **110** upstream thereof.

For this purpose, the upstream end of the water evaporation and condensation section **120**, contains a first or primary refrigeration evaporator coil **122**, which is supplied with refrigerant from a compressor unit **123**. An optional downstream second evaporator coil or additional coils, in combination with a pair of condenser coils, may be used to perform a two˜stage process of water extraction and cooling of the air being returned to the surrounding environment.

This first evaporator coil **122** condenses water vapor present in the filtered intake air as the air passes over the coil. This evaporator coil **122**, and associated compressor units employed in the invention may comprise commercially available components. In order to prevent corrosion and extend the life of the evaporator coils, it is mandatory that the coils be externally coated by a dipping, spraying,

brushing application and/or molecular deposition using a corrosion resistant material for use in potable water systems, approved by NSF and certified to ANSI/NSF 61. An option in association with the primary evaporator coil **122** is a de-icing heater element **124H**, upstream of the evaporator coil and/or an automatic hot-gas defrost, which is controllably operative to prevent freezing of the evaporator coil when the unit is operating in temperatures below sixty-five degrees Fahrenheit, may be provided.

Also installed in the water evaporation and condensation section **120**, downstream of condensing coil **104** is a forced air unit/fan assembly **124**, which is controllably operative to draw ambient air into the system. The operation of the fan assembly **124** is controlled in accordance with the output of a high/low level sensor of the water storage tank **220** of the water storage stage **200**. In particular, the fan assembly **124** is activated to draw air into the system, as long as the water level sensor element detects that the quantity or volume of water within the storage tank **220** is below a prescribed "full" or "high" level. However, when the high level sensor detects that the storage tank **220** is full, the various powered components of the water extraction stage **100**, including the compressor(s) of the evaporator **122** and condenser unit(s) **104** and the forced fan **124** are turned off (as a non-limiting example).

As an option in the airflow path immediately downstream of the fan assembly **124**, an arrangement of one or more evaporator and condenser coils may be installed, comprising respective primary and secondary coils over which the drawn-in and filtered intake air passes. These coils condense/extract water from the water vapor in the air flowing through the water extraction stage **100**. The condensed water drips through a filter element **222** into a storage tank **220**

attached to the sealed housing of water extraction stage **100** and is channeled into the water storage tank **220**.

FIGS. 1 and **2** show the water filter **222** and storage tank **220**. The filtered water in the storage tank **222** is biologically treated with an optional ozone or ultraviolet light or other biological treatment.

As pointed out above and shown in **FIG. 1**, water usage is monitored by a water level sensor unit **204**. The water level sensor **204** is operative to control the operation of the components of the water extraction stage **100**, described above, including its fan and compressor units, in accordance with the water level within the water collection tank **220**. As long as the water collection tank **220** is below the set point, the water extraction stage **100** is operative to draw ambient air into the system, and causing water vapor in the intake air to be extracted, collected, and supplied to the water storage stage **200**. However, when the water level sensor **204** detects a "full" tank condition, it shuts off driven components [compressor(s), fan unit(s)] of the water extraction stage **100**.

An optional water flow pump **225** may be provided and controlled by an internal pressure switch which activates the pump on low discharge head and stops the pump when set pressure is obtained.

The flow pump **225** delivers water under pressure to remote locations and to the refrigeration for chilled water or to the ice cube maker, additional filtration may be provided at the output of the water flow control pump **225**. As described below, through a series of progressively finer porosity filters, the multistage water filtration and delivery stage **300**, effectively filters out (absorbs/blocks) substantially all particulate, chemical, and biological contaminants from the treated water as its being pumped from the storage tank **220** for delivery to one or more water outlet valves of an optional purified water delivery section **340**.

More particularly, an optional multistage water filtration section **310** may be provided to include an optional pH adjustment filter **321**, such as a calcite filter or a 10 micron sediment filter.

The next filter may be a resin bead, a demand-release ionized disinfectant filter or a 0.5 micron carbon block filter **322** that absorbs chemical components, such as halogens (e.g., chlorine, bromine, iodine) and other chemicals, including industrial and agricultural residual chemical compounds, to improve taste, smell, and quality of water.

The final filter element of the multistage filtration section is a 0.5 or a 5.0 micron carbon block filter **323** installed downstream of the 0.5 micron carbon block filter **322**. This filter also filters out herbicides, pesticides, industrial and commercial cleaners and other Trihalomethanes (THMs). The carbon block filter **323** may also contain an ultra violet light to kill viruses and bacteria which may be in the water.

This and other different combinations of filters at filter locations **321, 322,** and **323** may be used to suit the user.

As water is pumped through the multistage filtration section **310**, it is monitored via a flow meter **312**, installed in the water flow path. Flow meter **312** prevents the flow of water through the water flow path to the purified water delivery section **340**, when the system has reached a maximum gallon usage (e.g., 1200/1500 gallons), and the water filters require replacement.

As water is pumped through the multistage filtration section **310** it is supplied directly to the purified water delivery section **340**, which provides the purified water on demand by way of output valves of a multi-tap water dispensing system. As described above, and as diagrammatically illustrated in **FIG. 3**, the purified water delivery section **340** is configured not only to directly deliver

purified room temperature water as filtered by the multistage filtration section **310**, but contains a plurality of purified water conduits, that are respectively coupled to a water heater **372**, a water cooler **373**, a direct feed room temperature output valve **334**, and a supply valve to the refrigerator ice maker and/or chilled water supply **375**. In addition, it may be coupled to a flavoring additive supply tank which stores a flavoring additive, such as a flavored soft drink syrup and a carbonation tank **390**. A mixing valve **391** thus allows the water to be mixed with additives (e.g., flavoring and/or carbonation), as desired to be delivered from a beverage dispenser **392** through a valve **320**.

The demand for water is sensed by operation of one of the water output valves of the multi-tap water dispensing system. This causes a reduction in the water pressure in the water flow path, which is sensed by a low pressure sensor in the pressure demand pump **225**, activating the water pump **225**, causing the water pump **225** to pump water through the multistage filtration section **310** to the purified water delivery section **340**.

As described above, electrical power for operating the water extraction and purification system of the present invention may be derived from any conventional AC source, such as 110 VAC, 60 Hz, 230 VAC, 60 Hz, or 208 VAC, 50 Hz.

In addition, as diagrammatically illustrated in **FIG. 4**, optional auxiliary emergency power for operating subsystem water supply components may be supplied by a number of sources. These sources include a commercially available 12 volt direct current wind-driven generator **401**, and a commercially available 12 volt direct current photoelectric solar array **403**, which are connected via external connection terminals and a switch **407** to a 12 volt direct current storage battery **410**.

A DC-AC converter **412** is coupled to storage battery **410** for supplying emergency 110 VAC power or an optional voltage and frequency. An auxiliary emergency (power outage) battery back-up trickle charge circuit **411** may also be coupled in the circuit with the switch **407**, to selectively provide a trickle charge to the battery **410**. The trickle charger **411** keeps the 12 volt direct current storage battery **410** fully charged. Storage battery **410** maintains a full charge, so as to enable the water pump associated with the output taps of the water dispenser, to be operated, without conventional power. Thus, in the event of a power outage, the auxiliary power supply will at least power those components that will allow the user to be supplied with whatever water is in the water storage tank **220**.

Units without the optional pressure demand flow pump **225** and multistage water filtration and delivery stage **300** are provided with a gravity drain faucet **227** on the storage tank **220** and/or an optional hand pump **226** to deliver pure water for consumption, as shown in **FIGS. 1** and **2**.

As will be appreciated from the foregoing description, the present invention provides a relatively compact, integrated and sealed purified water supply apparatus that is not only operative to extract, store, and purify water from water vapor in ambient air, but prevents entry of contaminants in the surrounding atmosphere from entering the system. The ambient air intake filtering section employs an active electrostatic filter which reduces airborne contaminants prior to extracting water from the air assuring water purity. Thus, when the filtered air is exhausted to the surrounding atmosphere it improves the air quality as well.

The optional multistage water and delivery filtration section **310**, provides superior water purification, eliminating ninety-nine percent of bacteria, viruses

and other microorganisms, ninety-seven percent of industrial and agricultural chemicals, and ninety-nine percent of herbicides, pesticides, solvents and other Trihalomethanes (THMs). In addition, the ultra violet light **380** is destructive to bacteria, mold, and viruses that may be in the water after filtration.

This highly purified water is available to the user in a variety of optional modes by way of the purified water delivery section **340**, and the optional delivery section **350**.

Results of analysis of water extracted and purified by the present invention have shown a remarkable purity of the water, which is understood to far exceed requirements of the U.S. Environmental Protection Agency (EPA). Indeed, tests have shown that purified water provided by the extraction, treatment and filtration system of the present invention is free of ninety-nine percent (99%) of all bacteria, viruses and other microorganisms, herbicides, pesticides, industrial and commercial cleaners and other Trihalomethanes (THMs), and ninety-seven percent (97%) of chemical contaminants, including industrial and agricultural residual chemical compounds.

While we have shown and described an embodiment in accordance with the present invention, it is to be understood that the same is not limited thereto but is susceptible to numerous changes and modifications as are known to a person skilled in the art, and we therefore do not wish to be limited to the details shown and described herein, but intend to cover all such changes and modifications as are obvious to one of ordinary skill in the art.

Claims

Having thus described our invention, we claim:

1. An ambient air water extraction apparatus comprising:

a water extraction stage having an intake air filter section, said intake air filter section including an air inlet port, and containing at least one intake air filter through which intake air passes, an evaporation and condensation section coupled in an air flow path with said intake air filter section, and containing at least one water extraction element that is operative to extract water vapor present in air that has passed through said intake air filter section and an exhaust air section coupled in an air flow path with said evaporation and condensation section to exhaust the filtered, dehumidified air to a surrounding atmosphere; and

a water storage tank coupled in sealed communication with and being operative to store water supplied thereto from said water extraction stage.

2. An ambient air water extraction apparatus according to claim 1, further including a forced air mechanism which is operative to force air through said intake air filter section, said evaporation and condensation section and exhaust the filtered and dehumidified air to the surrounding atmosphere.

3. An ambient air water extraction apparatus according to claim 2, wherein said forced air mechanism is operative to force air out of the apparatus into the surrounding atmosphere.

4. An ambient air water extraction apparatus according to claim 2, wherein said water storage tank contains a water level sensor that controls the

operation of said forced air mechanism in accordance with the water level in the said water storage tank.

5. An ambient air water extraction apparatus according to claim 4, further including an optional water flow pump control coupled with said water flow path from said water storage tank and being controllably operative to pump water through said water flow path for delivery by said water flow control pump to at least one water outlet port.

6. An ambient air water extraction apparatus according to claim 1, wherein said evaporation and condensation section contains a first evaporator coil unit installed at a relatively upstream portion of said evaporation and condensation section, and an optional second evaporator coil unit installed at a relatively downstream portion of said evaporation and condensation section.

7. An ambient air water extraction apparatus according to claim 6, wherein said evaporation and condensation section further includes at least one optional condenser coil coupled in an air flow path past said first and optional second evaporator coils.

8. An ambient air water extraction apparatus according to claim 7, further including a forced air mechanism, which is operative to force air through said intake air filter section, said evaporation and condensation sections and said air exhaust to a surrounding environment.

9. An ambient air water extraction apparatus according to claim 1, wherein an optional said multistage filtration section may be provided to include a sequential arrangement of at least one of a pH adjustment filter, a sediment filter, a first carbon block absorption filter, downstream of said adjustment filter and sediment filter, a second carbon block absorption filter downstream of and having a finer porosity than said first carbon filter, said first and second carbon block absorption filters being operative to block chemical and biological contaminants, and an extraction filter downstream of said second carbon block absorption filter being operative to block biological contaminants.

10. An ambient air water extraction apparatus according to claim 1, further including an optional biological treatment dispenser coupled with said water storage tank and being operative to dispense biological contaminant treatment material into water stored in said storage tank.

11. The ambient air water extraction apparatus of claim 10 wherein the biological containment treatment material consists of at least one of ozone or ultra violet light.

12. An ambient air water extraction apparatus according to claim 1, further including an optional purified water delivery section coupled with the optional said multistage filtration section and said at least one water outlet port, and being operative to control at least one characteristic of water that has been filtered by said multistage filtration section.

13. An ambient air water extraction apparatus according to claim 12, wherein said optional purified water delivery section is operative to control at least the water temperatures (hot, cold, and ambient).

14. An ambient air water extraction apparatus according to claim 1, further including an optional water flow pump coupled with said water flow path from said water storage tank and being controllably operative to pump water through said water flow path and through said multistage water filtration and delivery section for delivery to at least one water outlet port, and including a water flow meter which is operative to controllably disable the operation of said water flow pump in response to a prescribed volume of water flow through said multistage water filtration and delivery section.

15. An ambient air water extraction apparatus comprising:

a sealed water extraction stage that is operative to draw in, filter and extract water vapor from ambient air, and to provide filtered processed air that has been dehumidified by water extraction before being returned to a surrounding environment;

a water storage stage, coupled in sealed fluid communication with said water extraction stage and being operative to treat and store water that has been condensed out of the filtered ambient air by said water extraction stage; and

an optional multistage water filtration and delivery stage installed in a sealed water flow path through a water flow control mechanism that is coupled in said sealed water flow path with said water collecting, filtration, biological treatment, and storage stage, said multistage water filtration and delivery stage containing a plurality of filters that are effective to filter out particulate, dissolved

chemicals and biological contaminants from water pumped by a water flow control pump prior to said delivery to one or more water outlet ports.

16. An ambient air water extraction apparatus according to claim 15, wherein said water extraction stage includes a forced air unit, that is controllably operative to draw ambient air through an intake air filter section that filters the air of unwanted airborne particles, and through a water evaporation and condensation section, containing an evaporator and condenser coil arrangement that condenses water form water vapor in the filtered intake air, prior to its being returned to the surrounding environment.

17. An ambient air water extraction apparatus according to claim 16, wherein said forced air unit and said evaporation and condensing section are controlled in accordance with the water quantity in said water storage tank.

18. An ambient air water extraction apparatus according to claim 17, further including an optional flow meter which monitors the flow of water pumped through an optional said multistage water filtration and delivery stage, and being operative to shut down said water pump, and thereby prevents the flow of water, in response to a water usage associated with the need to replace said water filters.

19. An ambient air water extraction apparatus according to claim 15, further including an optional purified water delivery section that supplies purified water on demand by way of output valves of an optional multi-tap purified water delivery section.

20. An ambient air water extraction apparatus according to claim 1, wherein electrical power for operating of components of said ambient air water extraction apparatus is derivable from optional power sources and at selected voltages and frequencies to suite available power supplies.

21. An ambient air water extraction apparatus according to claim 15, further including an optional purified water delivery section coupled to said multistage water filtration and delivery stage that provides, and dispenses potable drinking water in different forms which include at least one of room temperature, hot, cold, carbonated and/or flavored.

22. A method of supplying water comprising the steps of:

(a) filtering and dehumidifying ambient air in a sealed housing, so as to extract water therefrom and return dehumidified and filtered ambient air to the surrounding environment;

(b) filtering, biologically treating and storing, in a sealed water storage tank, water that has been extracted in step (a) and supplied to said storage tank by way of a filter through a water flow path that is sealed from said surrounding environment; and

(c) delivering potable water by passing water that has been treated and stored in step (b) through a plurality of water filters that filter out additional particulate, dissolved chemicals and biological contaminants from said water, then expose the purified water to an ultra violet light and delivering purified water to one or more water outlet ports.

23. A method according to claim 22, wherein step (a) comprises drawing said ambient air into said sealed housing through an air filter that filters said ambient air of unwanted airborne particles, and through a water evaporator and condenser coil arrangement installed in said sealed housing that condenses water from water vapor in air filtered by said air filter, prior to its being returned to the surrounding environment.

24. A method according to claim 22, wherein steps (a) and (c) are controlled in accordance with the water quality in said water collection tank.

25. A method according to claim 22, wherein step (c) further includes optionally monitoring the flow of water passing through said plurality or the multistage water filtration and delivery stage and interrupting the flow of water therethrough, in response to a water usage associated with the need to replace said plurality of optional water filters.

26. A method according to claim 22, wherein step (c) includes delivering said purified water using either one of a gravity drain faucet or optional hand pump through an optional said one or more water outlet ports by means of a purified water delivery section that supplies purified water on demand by way of output valves.

27. A method according to claim 22, wherein step (c) includes dispensing purified water in different forms, which include at least one of a room temperature, hot, cold, carbonated, flavored or frozen water.

28. A method according to claim 22, wherein steps (a) and (c) are performed by electrically driven components, and wherein electrical power for operating at least one or more of said electrically driven components is derivable from alternate power supplies including various voltages, frequencies, from one or more sources.

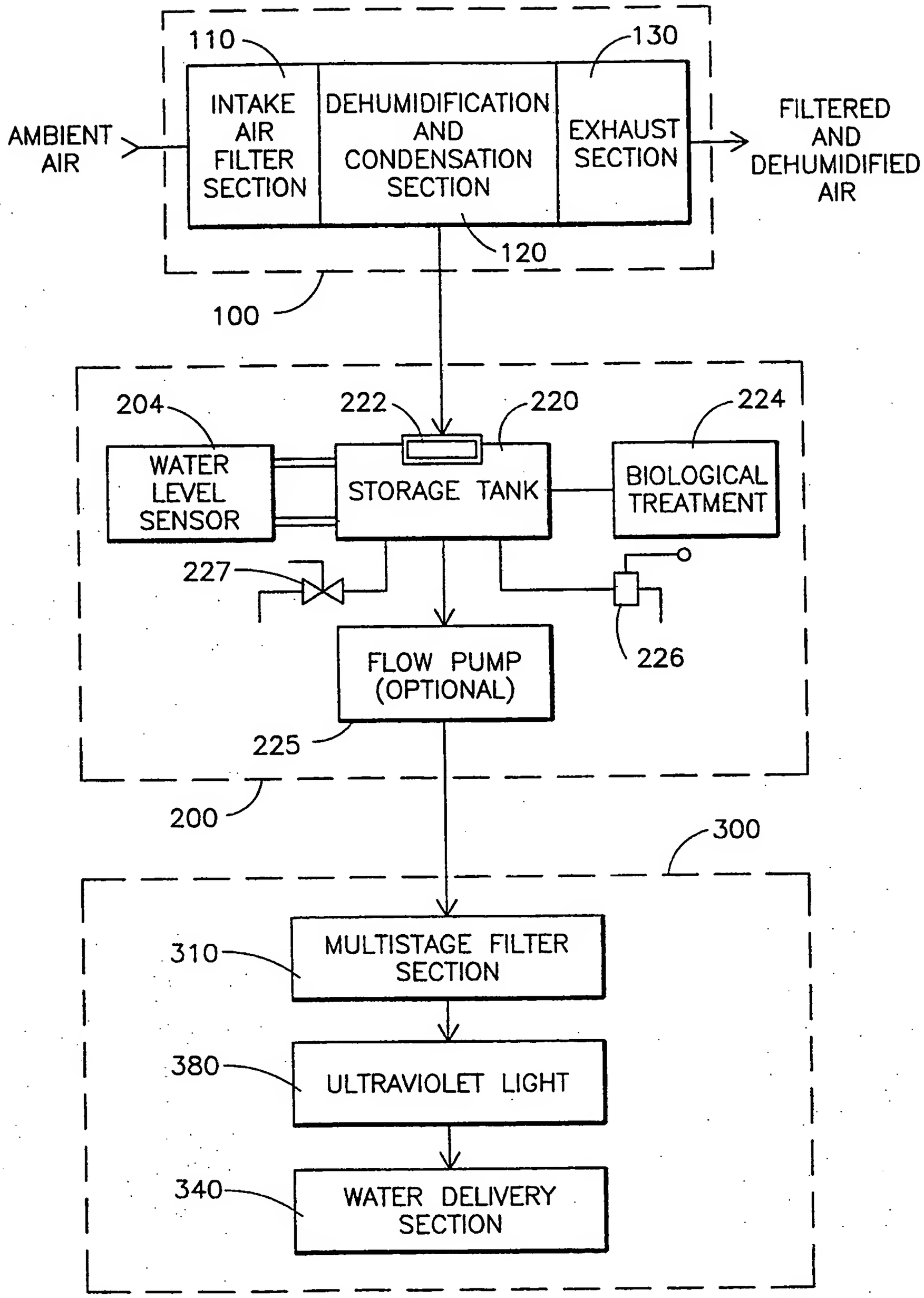
110
130
INTAKE AIR FILTER SECTION
DEHUMIDIFICATION AND CONDENSATION SECTION
EXHAUST SECTION
AMBIENT AIR
FILTERED AND DEHUMIDIFIED AIR
120
100
204
222
220
224
WATER LEVEL SENSOR
STORAGE TANK
BIOLOGICAL TREATMENT
227
226
FLOW PUMP (OPTIONAL)
225
200
300
310
MULTISTAGE FILTER SECTION
380
ULTRAVIOLET LIGHT
340
WATER DELIVERY SECTION

FIG. 1

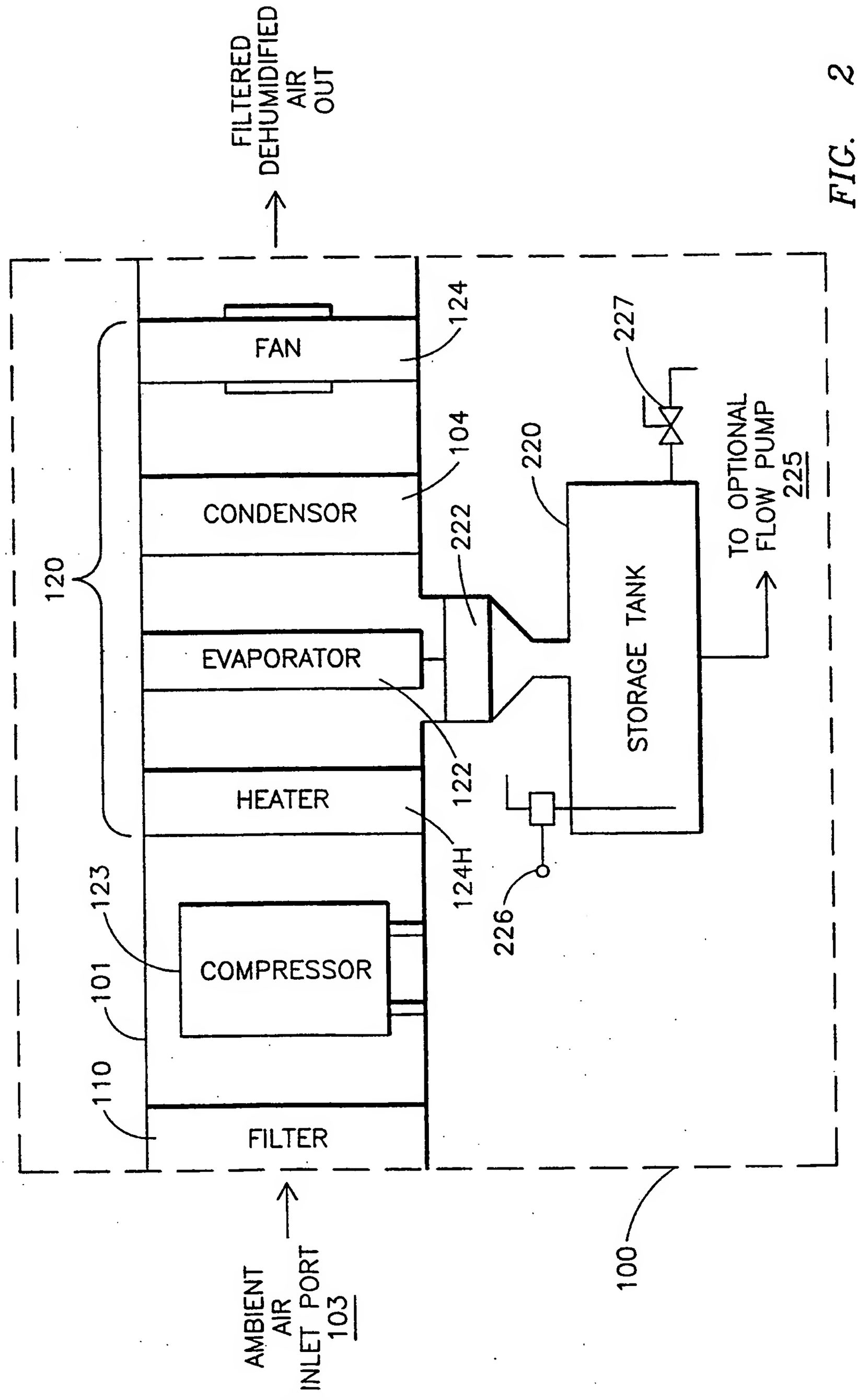
FILTERED DEHUMIDIFIED AIR OUT
FAN
124
227
CONDENSOR
104
220
222
TO OPTIONAL FLOW PUMP 225
120
EVAPORATOR
STORAGE TANK
HEATER
122
124H
123
COMPRESSOR
226
101
110
FILTER
AMBIENT AIR INLET PORT 103
100

FIG. 2

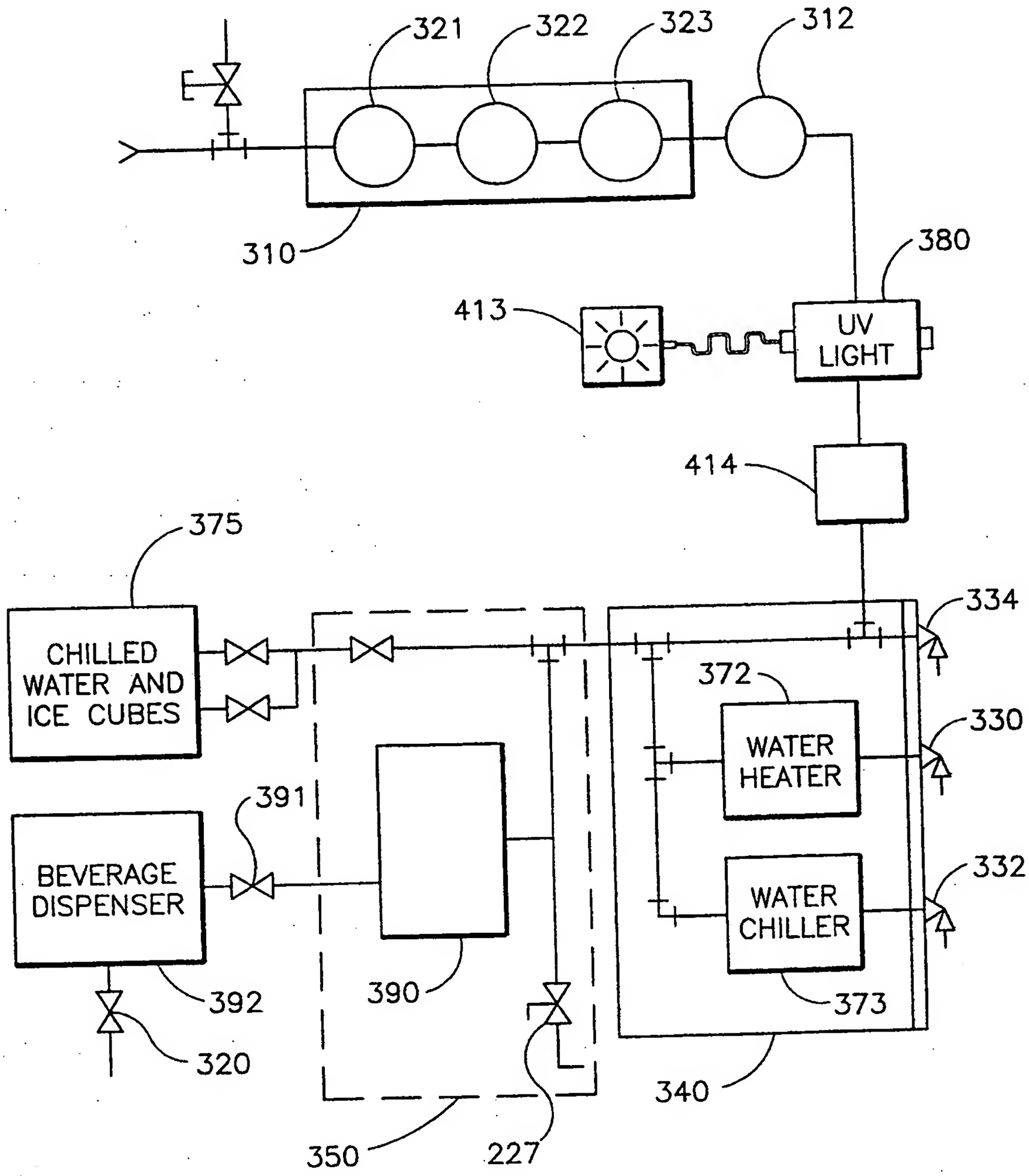
321
322
323
312
310
380
413
UV LIGHT
414
375
CHILLED WATER AND ICE CUBES
334
372
WATER HEATER
330
391
BEVERAGE DISPENSER
332
WATER CHILLER
392
390
373
320
340
350
227

FIG. 3

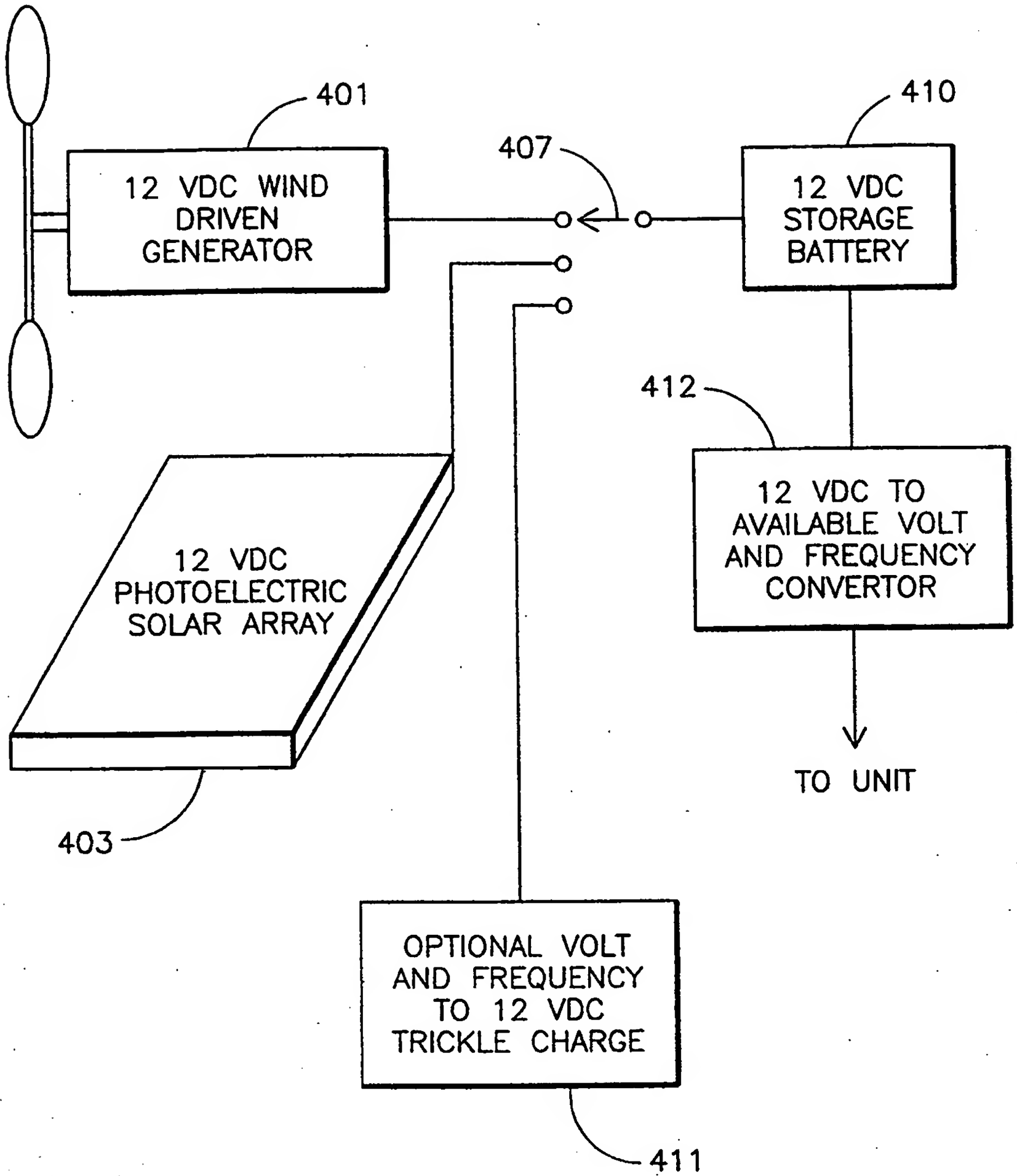
401
12 VDC WIND DRIVEN GENERATOR
407
410
12 VDC STORAGE BATTERY
412
12 VDC TO AVAILABLE VOLT AND FREQUENCY CONVERTOR
TO UNIT
12 VDC PHOTOELECTRIC SOLAR ARRAY
403
OPTIONAL VOLT AND FREQUENCY TO 12 VDC TRICKLE CHARGE
411

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/20667

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :F25D 17/06, 21/14; B67D 5/62
US CL :62/93, 150, 291

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 62/93, 150, 272, 291, 389-391; 210/669, 681, 754, 764

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,259,203 A (ENGEL et al) 09 November 1993, see entire document.	1-3, 6-10, 12, 13
X	US 5,517,829 A (MICHAEL) 21 May 1996, entire document.	1-3, 9, 10, 12, 15, 16, 19, 20-23, 27
X	US 5,701,749 A (ZAKRYK) 30 December 1997, entire document.	1-5, 9, 14-17, 21-26
X	US 5,106,512 A (REIDY) 21 April 1992, entire document.	1-5, 9-12, 14-28
X	US 5,669,221 A (LEBLEU et al) 23 September 1997, entire document.	1-28

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
05 JANUARY 1999	03 FEB 1999
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer WILLIAM C. DOERRLER Telephone No. (703) 308-0696

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/20667

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,669,221 A (LE BLEU et al) 23 September 1997, entire document.	1-28
A	US 5,514,344 A (D'AGARO) 07 May 1996, entire document.	10
A	US 5,729,981 A (MARKUS et al) 24 March 1998, col 3 lines 3-6.	20, 28

Form PCT/ISA/210 (continuation of second sheet)(July 1992)★